Biodiversity: Facts on the Foundation of Life

What is Biodiversity?

Biological diversity, or biodiversity, is the variety of all forms of life on Earth. Its complexity is measured in terms of variations at genetic, species, and ecosystem levels. Ever-responding to natural forces and human activities, the Earth's biodiversity is in a constant state of flux. As we'll see below, biodiversity plays a critical role in meeting human needs directly while maintaining the ecological processes upon which our survival depends.

Why Should We Care About Biodiversity?

Biodiversity is a necessity, not a luxury.

In recent years, the loss of entire species and natural areas, caused almost entirely by human activity, has been occurring at unprecedented rates. The extinction of each additional species brings the irreversible loss of unique genetic codes, which are often linked to development of medicines, foods, and jobs.

A one-acre patch of elm trees produces oxygen, removes carbon from the atmosphere, and captures at least 16 tons of airborne dirt, which rain then washes back to the ground as productive soil. 1

Biodiversity not only provides direct benefits like food, medicine, and energy; it also affords us a "life support system." Biodiversity is required for the recycling of essential elements, such as carbon, oxygen, and nitrogen. It is also responsible for mitigating pollution, protecting watersheds, and combating soil erosion. Because biodiversity acts as a buffer against excessive variations in weather and climate, it protects us from catastrophic events beyond human control. 2

The importance of biodiversity to a healthy environment has become increasingly clear. We have learned that the future well-being of all humanity depends on our stewardship of the Earth. When we overexploit living resources, we threaten our own survival. 3

Biodiversity is important to the global economy.

The economic value of biodiversity is a well-established fact. Modern agriculture, which depends on new genetic stock from natural ecological systems, is now a $3 trillion global business; nature tourism generates some $12 billion worldwide in annual revenues. 4 In the United States, the economic benefits from wild plants and animals comprise approximately 4.5% of the Gross Domestic Product. 5

In 1988, worldwide commercial trade in wild plants (excluding timber) and animals was valued at $5 billion. 6 That same year, the 20 best-selling drugs in the U.S., with combined revenues of about $6 billion worldwide, all relied on plants, microbes, and animals for their development. 7 Each wild plant that provides the chemical basis for developing new drugs is projected to generate at least $290 million annually. 8

Biodiversity is essential for ensuring food security.

All of the world's major food crops, including corn, wheat, and soybeans, depend on new genetic material from the wild to remain productive and healthy. Breeders and farmers rely on the genetic diversity of crops and livestock to increase yields and to respond to changes in environmental conditions. Plant breeding, using wild genetic stock and other sources, was responsible for half the gains in agricultural yields in the United States from 1930 to 1980. 9

The Earth's oceans, lakes, and rivers contain an abundance of food resources. At present, food production from wild stocks of fish is the single largest source of animal protein for the world's expanding population. In 1994, more than 10 billion pounds of fish, valued at about $4 billion, were caught and sold in the United States alone. 10

Teosinte, a wild relative of corn discovered in Mexico during the 1960s, is resistant to four of the eight major diseases that kill corn in the United States. 11

Had it been available to U.S. farmers in the 1970s, losses of $1 billion could have been avoided when disease wiped out uniformly susceptible varieties. 12 Corn is the essential ingredient in a range of products-from animal feed to corn syrup. Thanks to Teosinte, prices for grain-fed meats, soft drinks, and other corn-related foods have been kept low. This example shows that genetic biodiversity protects American farmers and consumers alike.

Biodiversity safeguards human health.

Of the top-selling 150 prescription drugs in the United States, 79% have their origins in nature.13 Many synthetic drugs, including aspirin, were first discovered in wild plants and animals. Roughly 119 pure chemical substances extracted from some 90 species of higher plants are used in pharmaceuticals around the world.14

Traditional medicine, which relies on species of wild and cultivated plants, forms the basis of primary health care for about 80% of all people living in developing countries. In the United States, traditional medicine and other alternative health systems are gaining in acceptance. Each year, the U.S. imports more than $20 million of rain forest plants valued for their medicinal properties.15

Despite such widespread popularity, only 2% of the 250,000 described species of vascular plants have been screened for their chemical compounds.16 Of those that have been screened, some show dramatic promise. For example, Taxol, a new drug developed from the Pacific yew tree, is being used to treat ovarian cancer.17

In 1960, a child with leukemia had a 1 in 5 chance of remission. Now, thanks to anti-cancer drugs developed from a compound discovered in wild periwinkle plants, the same child's chance of survival has increased to 80%.18

Biodiversity provides recreational opportunities.

In addition to protecting our future food supply, health, and environment, biodiversity provides an array of recreational opportunities and aesthetic value. In 1991, recreation associated with wild birds alone generated nearly $20 million in economic activity and 250,000 jobs in the United States, exceeding many Fortune 500 companies.19 Saltwater recreational fishing in the U.S. generates more than $15 billion

annually in economic activity and provides over 200,000 full-time jobs.20

U.S. parks brought in $3.2 billion from visitors in 1986.21 That same year, tourism in Kenya amounted to $400 million. In that country, the economic value of viewing elephants alone totaled $25 million in 1989.22 These large economic revenues reflect the high value people place on recreation involving biodiversity.

Biodiversity and the issues that affect it cross all national borders.

Air and water pollution do not respect national borders. Acid rain, which results when air pollutants mix with falling rain, is a good example. In North America, industrial emissions from U.S. factories have caused acid rain to damage sugar maples in Canada, threatening future maple syrup production.23

Perhaps the most serious threat to life on Earth is global climate change.24 In December 1995, the Intergovernmental Panel on Climate Change, composed of scientists and policymakers from 120 nations, agreed in writing that human activities are affecting the global climate.25

Carbon released from such human-induced activities as the burning of fossil fuels, forests, and other natural habitats is a major contributor to climate change.26 Tropical forest burning outside the U.S. has accounted for about 25% of all carbon released into the atmosphere over the past decade.27

Rapid build-up of carbon-dioxide and other greenhouse gases in the Earth's atmosphere, combined inextricably with ozone depletion, is causing our climate to change.28 The consequences for many species of wildlife and ecosystems, as well as for human populations, may be catastrophic.29 In the United States, warmer temperatures could result in the shifting of agricultural lands hundreds of miles north and cause severe coastal flooding.30 Species would be forced to migrate to keep up with optimum conditions, but the rate of change would be too fast for many to adapt.31, 32

On a global scale, loss of biodiversity can even threaten national security. There are many national and international conflicts over water, land, and other natural resources. Such environmental conflicts often lead to mass migrations of people that strain national budgets, public infrastructure, and international relations.33

Rates of species extinction are unprecedented.

Not since the disappearance of the dinosaurs has the rate of species extinction, the most common measure of biodiversity loss, been higher. Virtually all of the loss is caused by human activities, mostly through habitat destruction and overhunting.34 In the contiguous United States, 98% of virgin forests have been destroyed, and 54% of wetlands have been lost.35 Over the past 500 years, 200 species of plants and 71 species and sub-species of vertebrates have become extinct in North America alone; another 750 species are officially listed as endangered or threatened.36 Unfortunately, only 13% of the approximately 14 million species that inhabit the Earth have been described by scientists.37 With increasing human pressure on biological resources, rates of extinction can only be expected to accelerate.

Threats to Biodiversity

Although it is clear that biodiversity conservation is vital to human survival, living resources are increasingly threatened around the world. Some of the most direct threats and illustrative examples include:

- **habitat destruction** (burning or felling of old-growth forests)
- **overexploitation** (overhunting of elephants and rhinos)
- **pollution** (industrial emissions that cause acid rain)
- **global climate change** (the greenhouse effect and destruction of the ozone layer)
- **invasion by introduced species** (displacement of native songbirds in the U.S. by European starlings)

These direct threats are often driven by underlying social conditions, including increased per-capita consumption, poverty, rapid population growth, and unsound economic and social policies.

What Is Being Done To Conserve Biodiversity?

Conserving biodiversity is important to Americans. According to a 1993 public opinion poll, 89% of the public agrees that human beings have an ethical responsibility for protecting plant and animal species.38 Seventy-eight percent of Americans believe that greater protection should be given to fish and wildlife habitats on federal forest lands, and a large majority supports the Endangered Species Act.39

Public concern over the protection of wild plant and animal species often benefits society indirectly. For example, in 1972, public outcry over the declining populations of the American bald eagle caused the U.S. to ban the production and sale of the pesticide DDT; this chemical was later identified as a serious cancer-causing agent in humans.

Global concern over the unprecedented loss of living resources has brought governments together to draft the International Convention on Biodiversity. This comprehensive agreement recognizes, for the first time, that the conservation of biodiversity is a common concern of all the world's people.40 Already, more than 100 countries have ratified it. By adding its signature to the Convention, the United States would send the global community a strong message about its commitment to protecting biodiversity.

Public acknowledgement of the importance of biodiversity has begun to influence U.S. foreign policy. Increasingly, through the United States Agency for International Development (USAID) and U.S.-based nongovernmental organizations, the U.S. is helping other countries link their economic and social development with the conservation and sustainable use of natural resources. Informed leadership, supported by a growing public awareness, is critical to meeting the social, economic, and environmental challenges the world now faces.

What Can We Do?

As individuals, we can help conserve biodiversity by:

- investing in and supporting environmentally sound businesses;
- supporting local, national, and international conservation efforts;
- minimizing our consumption of gasoline, electricity, and material goods;
- becoming informed about legislation that affects the world's biodiversity and sharing our concerns with our elected representatives.

As a society, we can all move to curb our use of energy, eliminate our consumption and use of threatened species, and support the transformation of national and international policies to those that are more

sustainable and less harmful to biodiversity.

Biodiversity Support Program

The Biodiversity Support Program (BSP) is a consortium of World Wildlife Fund, The Nature Conservancy, and World Resources Institute, funded by the United States Agency for International Development. BSP works to conserve biodiversity by supporting innovative, on-the-ground projects that integrate conservation with social and economic development; research and analysis of conservation and development techniques; and information exchange and outreach.

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